# Good as gold.

Our complete cable offer makes mining more sustainable.


Prysmian Group

Linking the Future

# CONNECTING THE WORLD. TODAY AND IN THE FUTURE.

**Prysmian Group is world leader in the energy and telecom cables and systems industry.**

**With 140 years' experience, the Group is strongly positioned in high-tech markets and offers the widest possible range of products, services, technologies and know-how.**

**140**
YEARS OF EXPERIENCE

**25**
R&D CENTRES AROUND THE WORLD

**We specialise in underground and submarine cables and systems** for power transmission and distribution, special cables for applications in many different industries, and medium and low voltage cables for the construction and infrastructure sectors.

**For the telecommunications industry, the Group is the world's largest provider** of cutting-edge cables and accessories for voice, video and data transmission, offering a comprehensive range of optical fibres, optical and copper cables and connectivity systems.

**We are committed to environmental responsibility** in our production processes, the protection of the global environment, and the responsible management of relations with the local communities in which we work.

**For us, innovation means meeting the needs of our customers and communities** by understanding their business drivers as quickly as they do. To do that, our team of over 900 Research & Development professionals is constantly looking to the future, predicting and identifying emerging trends in each of our industries and sectors. Acting on this intelligence from 25 R&D centres around the world, we're constantly close to our customers in their own local markets.

# Mining & Sustainability

The world's need for minerals is expected to ten-fold during the next decade. The production of minerals such as graphite, lithium, and cobalt could increase by nearly 500 % by 2050. To mine all these minerals while at the same time achieving zero-carbon emissions in the mining operations, calls for a transition towards clean energy and greater energy efficiency.

In fact, from lithium-ion batteries to photovoltaic cells, most green technologies require metals and minerals in their construction, thus essential for a low-carbon future. Consequently, the mining industry is driving the change, aiming for fully electrified, data-driven fleets.

In parallel, innovations and increased efficiency requirements within mines are leading to an increasingly extensive use of equipment operating at higher and higher voltages. The safety of personnel working in proximity of energized equipment, especially in underground mines, has become an increasingly crucial theme, too.

To meet the challenges Prysmian Group has, beside extremely resistant and flexible mining cables and technological breakthroughs, developed complete cable solutions for the mining industry. Solutions that will make the production flow flawless, enhance the safety of the workforce, and bring sustainable energy to power it all up.

## Our complete cable offer makes mining more sustainable – in many different ways.

Safe and sturdy cables saving you on cost, and the environment on $CO_2$ emissions? Sounds too good to be true, doesn't it? But it is the truth! Our complete offer of top-notch mining cables will cost you less in the long run. Being tough enough to endure the most uncompromising environments, in terms of everything from mechanical strains to chemical liquids and climate conditions, these cables will run flawlessly for years to come. Add to that a complete range of cables ready to provide every equipment on site with sustainable energy, and your business will have saved a lot more than just money.

## What we offer.

Prysmian Group has developed extensive know-how about mining equipment's special operational conditions over many years of close and continued cooperation with major mining operators, translating the experience gained on a daily basis into cable designs with outstanding operational reliability and extended service life.

Mining cables from Prysmian guarantee:

- Longer lifetime
- Unique mechanical performance
- Chemical and climate resistance
- Distribution of sustainable power

## A complete cable solution.

Prysmian Group designs, compounds and manufactures cables according to specific customer needs, including multifunctional cables from the simplest to the most sophisticated. It is our mission to be always ready to address demands and technical developments coming from new market challenges. Our innovation capabilities are always one step ahead.

### Opencast mining

Opencast mining requires ever-increasing performance of machines and methods. The larger and larger, movable machines in use nowadays require medium voltage flexible reeling and trailing cables for power supply suitable for operation under the most extreme conditions. Specialized energy and data transmission systems in such large machines need specially designed and optimized cables adapted to such individual demands.

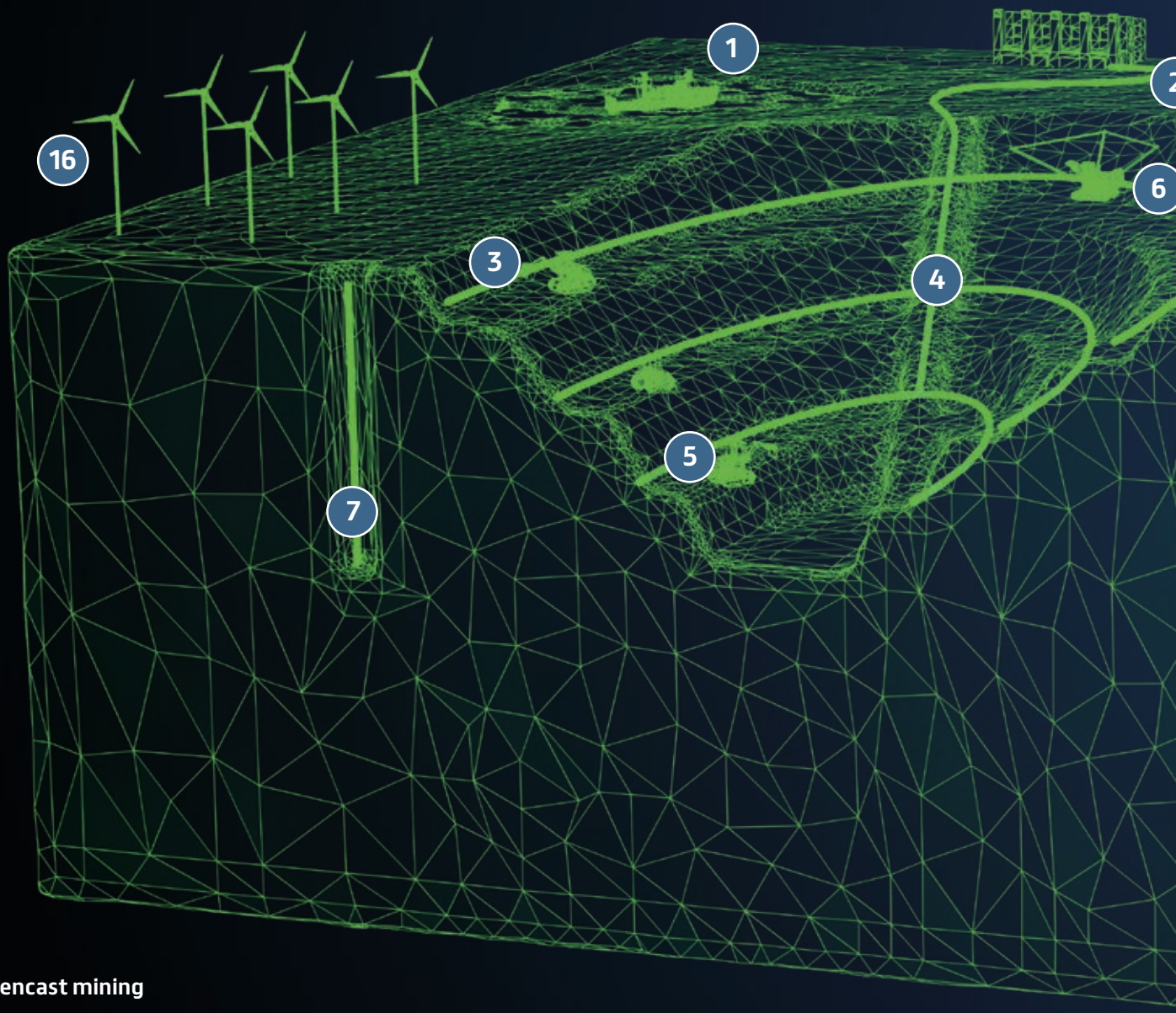
### Underground mining & Tunneling

Underground mining is characterized by a strong focus on critical electrical and mechanical safety aspects in addition to performance features. The cable designs should include all necessary power and control elements to fully match requirements, as well as control and signaling elements to notify any malfunctioning in order to minimize downtimes of machines and keeping the highest levels of safety.

### Supplementary solutions

It takes more than heavy tools to mine. First of all, you need electricity. Lots of it and preferably sustainable power to reduce your carbon footprints. Pumps are needed to get rid of water in different levels of contamination, and many of the tools need digital technology to be functional. To make it run smoothly and without costly down-time, heavy-duty cables that are both flexible and effective are highly required.

# Our electrification solutions for sustainable mining activities.




## Opencast mining

1 Dredger

2 Stacker/ Reclaimer

3 On board installation

4 Semi-fixed

5 Excavator Bucket wheel

6 Trailing

7 Submersible pump

## Underground mining & Tunneling

8 LHD, Scoop, Loader

9 Drill

10 Coal cutter – free trailing

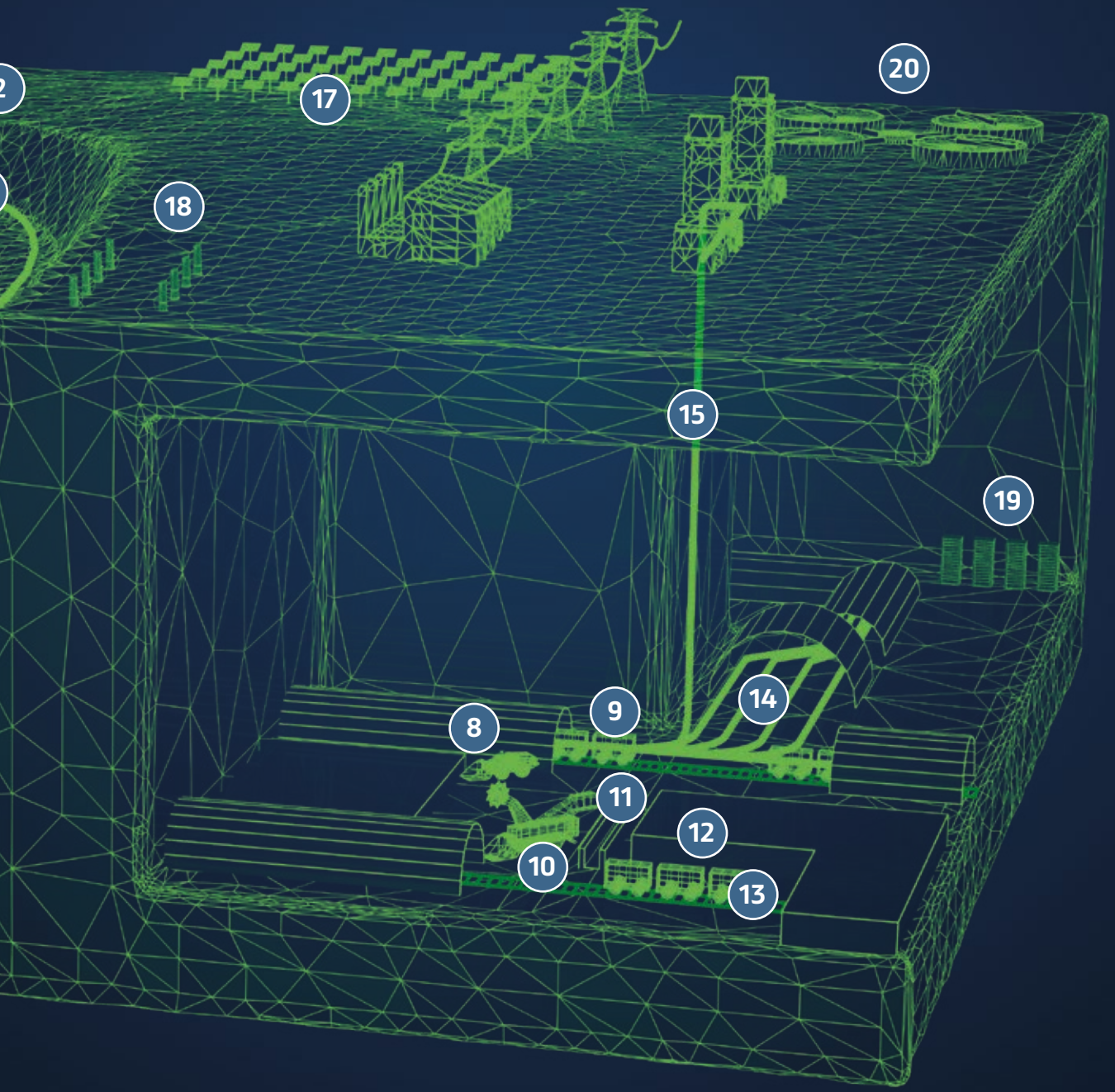
11 Coal cutter – chain application

12 Festoon

13 Shuttle car

14 Fixed installation

15 Shaft cable




**Supplementary solutions**

16 Wind turbines

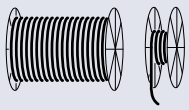
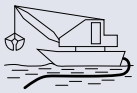
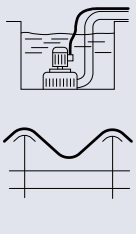
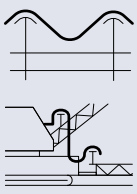
17 PV plants

18 EV Charging

19 Server

20 Water treatment

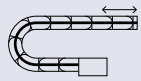
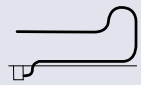
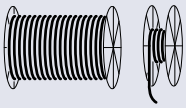
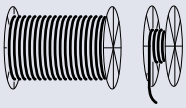
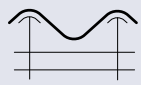
# Applications overview – **Opencast**

| Application group | | Product name | Designation | Description |
|---|---|---|---|---|
| MEDIUM VOLTAGE REELING CABLES | | | | |
|  |  | PROTOLON(M) | R-(N)TSCGEWOEU | MV reeling cable |
| |  | PROTOLON(M) with FO | R-(N)TSCGEWOEU | MV reeling cable with integrated fiber optic |
| |  | PROTOLON(IQ) | (N)TSKCGEWOEU | MV reeling cable with embedded sensor |
| MEDIUM VOLTAGE TRAILING CABLES | | | | |
|  |  | TENAX-SAS | NTSCGEWOEU | MV trailing cable abrasion and cold resistant (-50 °) |
| |  | PROTOLON(SB) | NTSCGEWOEU / NTSCGECEWOEU | MV trailing cable with or without metallic screen |
| |  | PROTOLON(SB-SAM) | (N)TSCGEWOEU / (N)TSCGECEWOEU | MV trailing cable with optimized dimensions |
| |  | TENAX-LUMEN | (N)TSCGEH3S | MV trailing cable with self-illuminating function |
| MEDIUM VOLTAGE DREDGING CABLES | | | | |
|  |  | PROTOLON(ST).../3E | NTSCGEWOEU | MV water resistant cable with individual concentric earth |
| |  | PROTOLON(ST) | NTSCGEWOEU | MV water resistant cable with earth into interstices |
| CABLES FOR SEMI-FLEXIBLE INSTALLATION | | | | |
|  |  | PROTOLON(M) | F-(N)TSCGEWOEU | MV cable for semi-flexible use |
| |  | PROTOMONT | NSSHOEU | LV cable for semi-flexible use, water resistant |
| |  | PROTOMONT | NSHXOEU | LV cable for semi-flexible use, LSOH |
| |  | PROTOMONT(MT) | (N)SSHOEU | LV cable for semi-flexible use, with optimized dimensions |
| |  | PROTOMONT EMV-FC | (N)SSHCOEU | LV screened cable EMC compliant for VFD |
| |  | PROTOMONT EMV-FC (-45°C) | (N)SSHCOEU | LV screened cable EMC compliant for VFD, cold-resistant |
| MEDIUM VOLTAGE SINGLE CORE CABLES | | | | |
|  |  | FELTOFLEX | NTMCWOEU | MV single-core cable with cold removable semi-con. layer |
| |  | PROTOLON | NTMCGCWOEU | MV single-core cable |
| |  | PROTOLON(M) | (N)TMCGCWOEU | MV single-core cable with optimized dimensions |
| CONTROL AND SIGNALING CABLES | | | | |
|  |  | OPTOFLEX(M) | G62.5/125, G50/125, E9/125 | Flexible fibre optic cable, also suitable for underground installation |
| |  | PROTOMONT(MSR) | 2YSLGCGOEU | Rubber sheathed screened data cable, also suitable for underground installation |

| Voltage range | Travel speed max. | Tensile force max. | Torsion max. | Sheath quality | Abrasion resistance | Water resist-ance | S-bendings in operation | Temp. range in fully flexible operation (°C) | Certificate/Approvals |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| 3.6/6 kV – 20/35 kV | 120 m/min | 25 N/mm² | +/- 100 °/m | 5GM5 | Very good | Good | Multiple planes | -35 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 20/35 kV | 120 m/min | 25 N/mm² | +/- 100 °/m | 5GM5 | Very good | Good | Multiple planes | -35 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 20/35 kV | 240 m/min | 30 N/mm² | +/- 100 °/m | 5GM5 | Very good | Good | Multiple planes | -35 to +80 | Gost-R/-K/-B, TR-CU |
| | | | | | | | | | |
| 3.6/6 kV – 12/20 kV | – | 25 N/mm² | +/- 100 °/m | 5GM5+ | Excellent | Very good | – | -50 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 12/20 kV | – | 15 N/mm² | +/- 100 °/m* | 5GM5 | Very good | Very good | – | -20 to +80 | VDE, MSHA, Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 12/20 kV | – | 20 N/mm² | +/- 100 °/m* | 5GM5 | Very good | Very good | – | -30 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 12/20 kV | – | 25 N/mm² | +/- 100 °/m | PUR | Very good | Very good | – | -50 to +80 | – |
| | | | | | | | | | |
| 1.8/3 kV – 18/30 kV | – | 15 N/mm² | +/- 25 °/m | 5GM3 | Good | Excellent | – | -25 to +80 | Gost-R/-K/-B, TR-CU |
| 1.8/3 kV – 18/30 kV | – | 15 N/mm² | +/- 100 °/m | 5GM3 | Good | Excellent | – | -25 to +80 | Gost-R/-K/-B, TR-CU |
| | | | | | | | | | |
| 1.8/3 kV – 18/30 kV | – | 15 N/mm² | +/- 100 °/m | 5GM3 | Good | Very good | – | -25 to +80 | Gost-R/-K/-B, TR-CU |
| 0.6/1 kV | – | 15 N/mm² | +/- 100 °/m | 5GM5 | Very good | Very good | – | -25 to +80 | VDE, MA-China, MSHA, EAC |
| 0.6/1 kV | – | 15 N/mm² | +/- 100 °/m | 5GM3 (LSOH) | Good | Very good | – | -25 to +80 | – |
| 0.6/1 kV | – | 15 N/mm² | +/- 100 °/m | 5GM5 | Very good | Very good | – | -25 to +80 | VDE |
| 0.6/1 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | Very good | Very good | – | -25 to +80 | MSHA, EAC |
| 0.6/1 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | Very good | Very good | – | -45 to +80 | MSHA, EAC |
| | | | | | | | | | |
| 3.6/6 kV – 18/30 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | Very good | Very good | – | -25 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 18/30 kV | – | 15 N/mm² | +/- 25 °/m | 5GM3 | Good | Very good | – | -25 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 18/30 kV | – | 15 N/mm² | +/- 25 °/m | 5GM3 | Good | Very good | – | -25 to +80 | Gost-R/-K/-B, TR-CU |
| | | | | | | | | | |
| – | – | max. 2000 N | +/- 100 °/m | 5GM5 | Very good | Very good | – | -30 to +80 | – |
| 250/250 V | – | max. 15 N/mm² | +/- 25 °/m | EM2 | Good | Good | – | -25 to +60 | EAC |

* +/- 25 °/m if with metallic screen

# Applications overview – **Underground/Tunneling**

| Application group | | Product name | Designation | Description |
|---|---|---|---|---|
| LOW AND MEDIUM VOLTAGE SHEARER CABLES | | | | |
|  |  | PROTOMONT(V) | NSSHCGEOEU | LV chain cable for shearers with double screen techn. and cold removable semi-con. layer |
| |  | PROTOMONT(V) | NTSKCGECWOEU | MV chain cable for shearers with double screen techn. and cold removable semi-con. layer |
| |  | PROTOMONT(VO) | (N)TSKCGEWOEU | MV chain cable for shearers with single screen techn. and cold removable semi-con. layer |
| |  | TENAX-CTE | NSSHKCGEOEU | LV chain cable for shearers with single screen techn. and semi-con. inner sheath |
|  |  | PROTOMONT(Z) | NSSHKCGEOEU | LV trailing cable for shearers with double screen techn., cold removable semi-con. layer and steel armour |
| UNDERGROUND REELING CABLES | | | | |
|  |  | TENAX-LK | NTSKCGEWOEU | LV reeling cable with single screen techn. and semi-con. inner sheath |
| |  | PROTOMONT(S) | (N)SSHCGEOEU | LV reeling cable with single screen techn. and cold removable semi-con. layer |
| |  | CORDAFLEX(S) | NSHTOEU | LV reeling cable for fast-moving LHDs, rubber sheathed |
| |  | TROMMELFLEX M-PUR | D2X11Y | LV reeling cable for slow-moving LHDs, PUR sheathed, halogen-free |
| TBM REELING | | | | |
|  |  | PROTOMONT TBM | (N)TSCGECWOEU | MV reeling cable for TBMs, with double screen techn. and cold removable semi-con. layer |
| |  | PROTOMONT TBM | (N)TSCGECWHXOEU | MV reeling cable for TBMs, with double screen techn., cold removable semi-con. layer, LSOH |
| |  | TENAX-HTT | (N)TSCGEWOEU | MV reeling cable for TBMs, with single screen techn. |
| CABLES FOR SEMI-FIXED INSTALLATION IN UNDERGROUND MINES AND TUNNELS | | | | |
|  |  | PROTOMONT (Festoon) | NTSKCGECWOEU | MV cable for semi-flexible use, with double screen techn. and cold removable semi-con. layer |
| |  | SUPROMONT | (N)3GHSSYCY | MV armoured cable for fixed installation, with double screen techn. and cold removable semi-con. layer |
| |  | SUPROMONT | (N)3GHSSHCH | MV armoured cable for fixed installation, with double screen techn. cold removable semi-con. layer, LSOH |
|  |  | PROTOMONT(MT) | (N)SSHOEU | LV cable for semi-flexible use, with optimized dimensions |
| |  | PROTOMONT ../3E | NSSHOEU | LV cable for semi-flexible use with individual concentric earth |
| |  | PROTOMONT EMV-FC | (N)SSHCOEU | LV screened cable EMC compliant for VFD |
| |  | PROTOMONT EMV-FC (-45°C) | (N)SSHCOEU | LV screened cable EMC compliant for VFD, cold-resistant |

| Voltage range | Travel speed max. | Tensile force max. | Torsion max. | Sheath quality | Min. bending radii at | | S-bendings in operation | Temp. range in fully flexible operation (°C) | Certificate/Approvals |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | max. 5N/mm² | max. 15N/mm² | | | |
| 0.6/1 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | 2.3xD | 5xD | – | -20 to +80 | MA – China, MSHA, EAC, BAS |
| 1.8/3 kV – 3.6/6 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | 2.3xD | 5xD | – | -20 to +80 | MA – China, MSHA, WUG, Gost -R/-K/-B, TR-CU |
| 1.8/3 kV | – | 15 N/mm² | +/- 50 °/m | 5GM3 | 2.3xD | 5xD | – | -20 to +80 | MA – China, Gost -R/-K/-B |
| 0.6/1 kV | – | 15 N/mm² | +/- 50 °/m | 5GM5 | 2.3xD | 5xD | – | -20 to +80 | EAC |
| 0.6/1 kV | – | 40 N/mm² | +/- 10 °/m | 5GM5 | – | 5xD | – | -20 to +80 | MA – China, MSHA, EAC, BAS |
| 0.6/1 kV | 160 m/min | 30 N/mm² | +/- 100 °/m | 5GM5 | – | 6xD | Multiple planes | -25 to +80 | EAC |
| 0.6/1 kV | 160 m/min | 30 N/mm² | +/- 50 °/m | 5GM5 | – | 6xD | Multiple planes | -25 to +80 | MA - China, EAC |
| 0.6/1 kV | 160 m/min | 30 N/mm² | +/- 25 °/m | 5GM5 | – | 6xD | Multiple planes | -25 to +80 | MSHA, EAC |
| 0.6/1 kV | 60 m/min | 25 N/mm² | +/- 50 °/m | PUR (HF) | – | 8xD | Single plane | -30 to +60 | – |
| 6/10 kV – 18/30 kV | 30 m/min | 30 N/mm² | +/- 25 °/m | 5GM5 | – | 12xD | Multiple planes | -20 to +80 | Gost-R/-K/-B, TR-CU |
| 6/10 kV – 18/30 kV | 30 m/min | 30 N/mm² | +/- 25 °/m | 5GM3 (LSOH) | – | 12xD | Multiple planes | -20 to +80 | Gost-R/-K/-B, TR-CU |
| 6/10 kV – 18/30 kV | 30 m/min | 15 N/mm² | +/- 100 °/m | 5GM5 | – | 12xD | Multiple planes | -20 to +80 | Gost-R/-K/-B, TR-CU |
| 3.6/6 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | – | Fix 6xD Flex 10xD | – | -25 to +80 | MA – China, WUG, BAS, Gost-R/-K/-B, TR-CU |
| 3.6/6 kV – 18/30 kV | – | 15 N/mm² | +/- 25 °/m | PVC YM5 | – | Fix 6xD Flex 10xD | – | -5 to +60 | VDE |
| 3.6/6 kV – 18/30 kV | – | 15 N/mm² | +/- 25 °/m | HM4 (LSOH) | – | Fix 6xD Flex 10xD | – | -5 to +60 | VDE |
| 0.6/1 kV | – | 15 N/mm² | +/- 100 °/m | 5GM5 | – | Fix 4xD Flex 5xD | – | -25 to +80 | VDE |
| 0.6/1 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | – | Fix 4xD Flex 5xD | – | -25 to +80 | MA-China, MSHA, EAC, BAS |
| 0.6/1 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | – | Fix 4xD Flex 5xD | – | -25 to +80 | MSHA, EAC |
| 0.6/1 kV | – | 15 N/mm² | +/- 25 °/m | 5GM5 | – | Fix 4xD Flex 5xD | – | -45 to +80 | MSHA, EAC |

# Supplementary solutions

## Water treatment

**Brands:** HYDROFIRM, OZOFLEX, TECWATER

For fluids to flow they must be pumped. And for these pumps to operate continually, cables are critical and must resist to hydrocarbons, oils, acids, chlorine, sulphates and many other chemical substances. Whether for a high-power pumping system or a portable pump, we offer a complete range of high performance and reliable solutions that ensure a long lifetime, and in compliance with the most demanding standards for drinking water, invulnerability to aggressive chemical and environmental agents.

**Water treatment**
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**Hot water**
Our pump cables for hot water applications can resist temperatures up to 120 °C with the highest needed lifetime. They are available in round and in flat designs.

**Drinking water**
We offer both round and flat power and control cables for drinking water pumps. They are available in screened and standard versions and for MV pumps and approved for the most common national requirements.

**Waste water**
Our submersible cables for waste water are highly resistant to chemicals and oil. They are available as power and control cables as well as tailormade hybrid cables according to customer needs. Available for FC drives, in medium voltage and in halogen-free versions.

# Sustainable Energy Solutions

## Wind turbines

**Brands**: WINDFLEX®, TECWIND™, FELTOFLEX®

As a world leader in special cables for wind turbines, we are able to manufacture products for the wind industry including all voltages and, if required, fully assembled cable sets. At our German and international production sites we develop and manufacture:

- **Nacelle/Loop:** Special cables (optional halogen-free and flame retardant) with increased oil, heat and ozone resistance, as well as optimized torsion properties up to 66 kV. Our high voltage cables are now available as lead-free version.
- **Tower:** Special cables (optional halogen-free and flame retardant) up to 66 kV for fixed installation with copper or aluminium conductors with excellent installation properties. Our high-voltage cables are now available as lead-free version.
- **Wind farm cabling:** From the low and medium voltage cables for the wind farm infrastructure, through to the high voltage grid, we supply all cables for onshore and offshore applications. In addition, we are able to supply cables as preassembled cable sets, as well as a service for fitting and commissioning or maintenance and turbine monitoring.

**Wind turbines**
Scan or click to go to Web catalogue

## PV plants

**Brand:** TECSUN©

On land or floating at sea, with our cables you can bring sustainable sun power all the way from the solar plants, through the distribution grids and into the many homes and offices. Our one-stop-shop-strategy supports you with all that you need to feed societies with renewable energy.

Reflecting our commitment to both innovation and sustainability, we offer a full range of quality photovoltaic products, renowned in the field for their easy installation, reliability and longevity attributes and complying with all major international standards. Our technologies are hard at work across the renewables sector, supporting the operations of contractors, developers, grid operators, PV panel makers, PV power generation system integrators and even entire solar parks.

**PV plants**
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# EV Charging

**Brand:** PRYCHARGE

No matter where and under what conditions, you can rely on us being your best partner for high-quality EV charging cables. Obviously enough our superior AC and DC PRYCHARGE EV cables can supply power to all electric and hybrid vehicles on the market and are compatible with all commercial and residential charging applications. More importantly our state-of-the-art cable designs, using an EVI-2 cross-linked control core concept, provide a full range of performance characteristics, including long-term durability in the harshest environments and the most heavy-used applications.

Thanks to our German engineers' relentless work in optimising our offer, a smaller diameter makes the cables surprisingly flexible and easy to handle. In addition our EV charging cables can be customized to suit your exact requirements including outer diameters for older sealing- and connector generations. The PRYCHARGE DC cable in addition has a special cross-linked EVI-2 HEPR power core rubber insulation, making the cable extremely durable and still very flexible at low temperatures, while allowing conductor operating temperatures and current carrying capacities up to 120 °C.

**EV Charging**
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## Server

**Brand:** Draka UC FUTURE

We offer server solutions designed to meet both current and future demands – always with greater bandwidths, absolute reliability and total flexibility at the centre of development.

Draka UC$^{FUTURE}$ cat cables facilitate the move to a next-generation 40–100 Gb ethernet. The need for high reliability, along with the demand for cost efficiency, has established a widely accepted cabling concept in recent years, which today is well defined in international standards like EN50173-5 or TIA942. Our cables meet all relevant requirements for packing density in data centres.

**Server**
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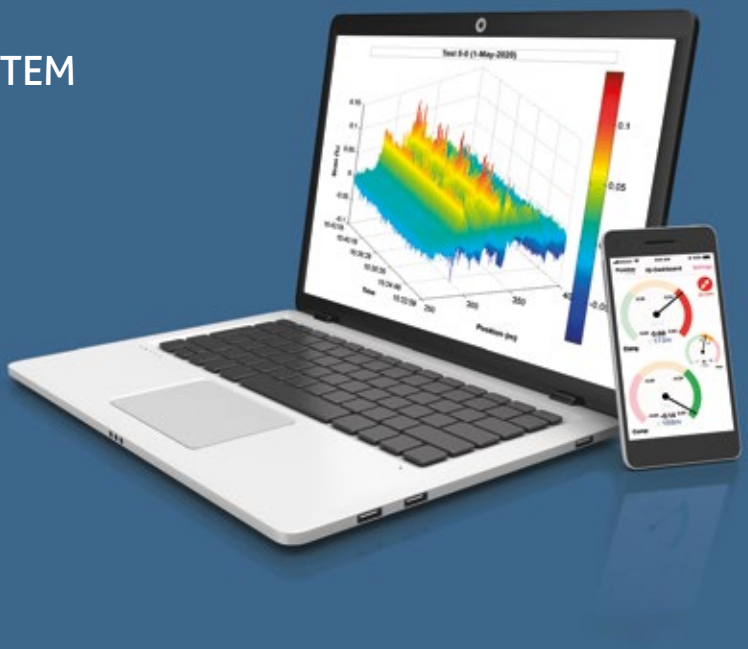
## PROTOLON (IQ) MONITORING SYSTEM

To avoid expensive downtime hours due to damaged cables, we've developed the PROTOLON(IQ) System. It includes intelligent MV reeling cables measuring mechanical and thermal stress, a monitoring system and easy-to-use software.

By knowing the cable conditions, an effective pro-active maintenance of the cable and guiding elements can be carried out in time. You're also able to record dynamic events that induce elastic strain peaks, which can damage the cable by fatigue over time. Such monitoring can also prevent unexpected out-of-service events and substantially reduce unnecessary costs.

In short, by monitoring and being able to process data in real-time, you will be able to vastly prolong the lifetime of the cable, increase reliability as well as predictability and, thus, prevent downtime and lower your costs.



**PROTOLON (IQ) MONITORING SYSTEM**
Scan or click for more information

Prysmian Group

Linking the Future

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